

Fire Island National Seashore

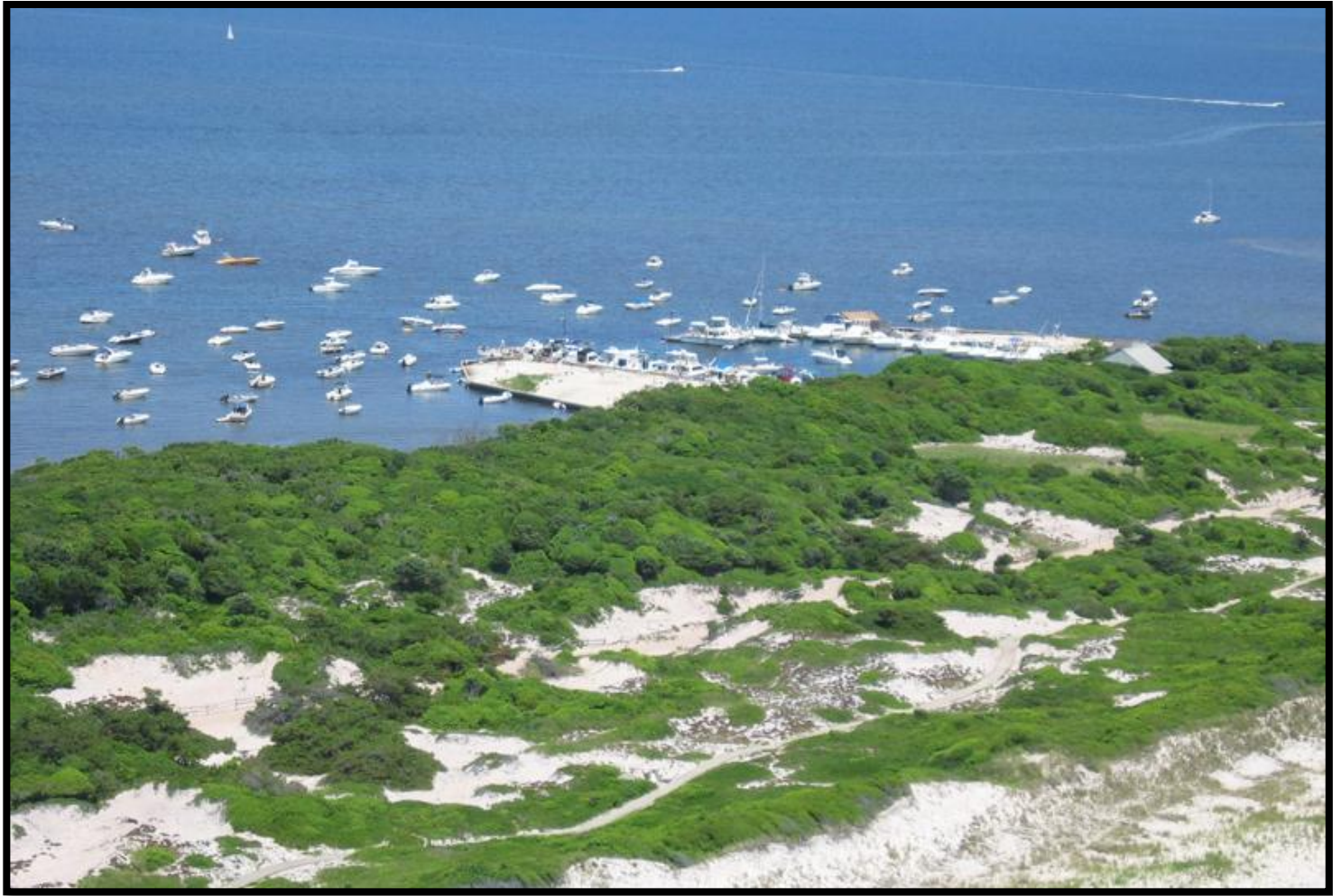


Science at Sailors Haven

Restoration of a Process



Fire Island is a 32 mile long barrier island on the south shore of Long Island, NY.



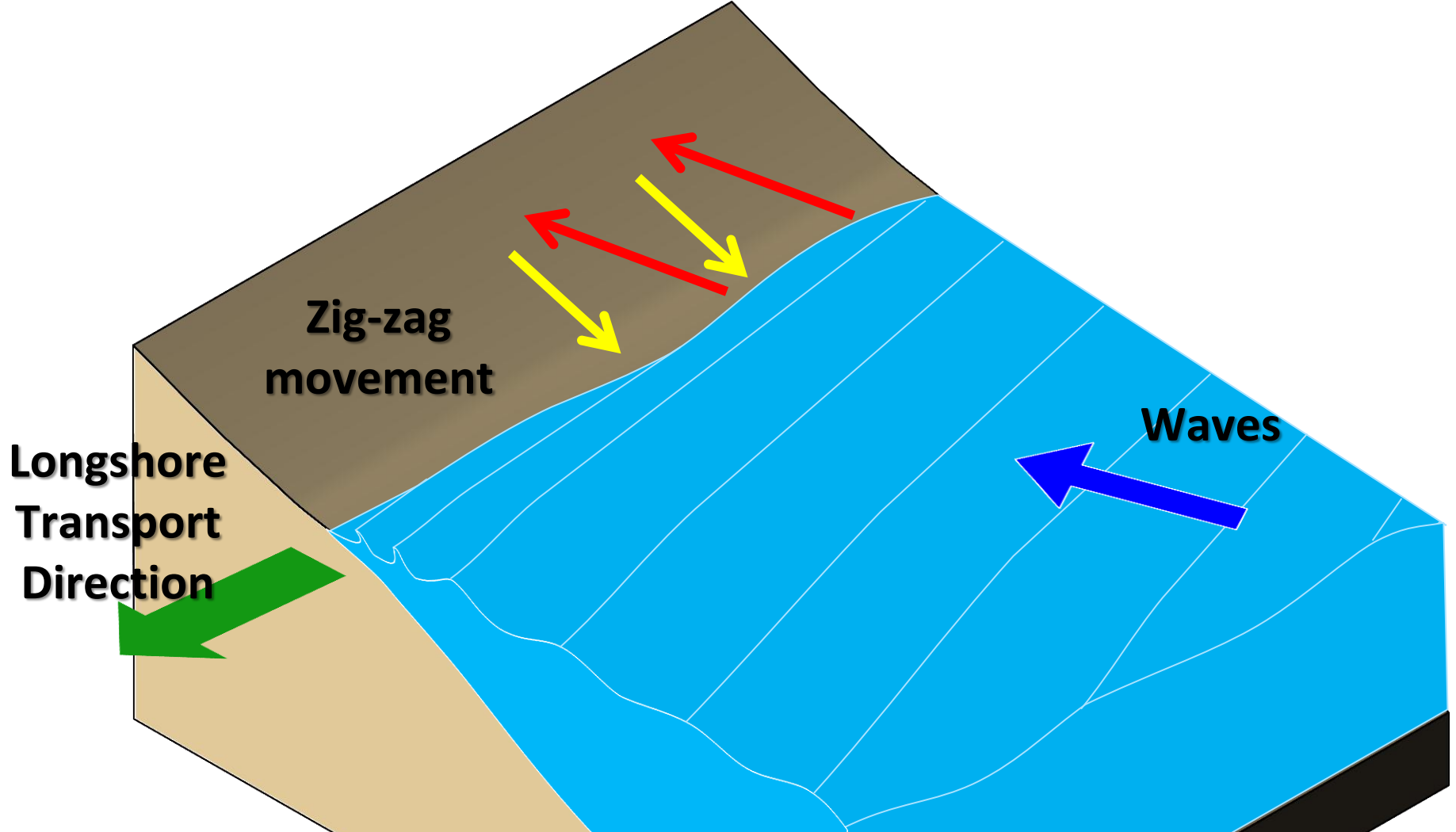
Sailors Haven is one of the popular destinations on Fire Island. Most visitors arrive on private boats or the ferry at the marina.



The Sunken Forest, a globally rare maritime holly forest, sits right next to and is accessible via the Sailors Haven marina.



Sand, whether in the ocean or bay, is constantly on the move. Movement along the shoreline is called *longshore transport*.



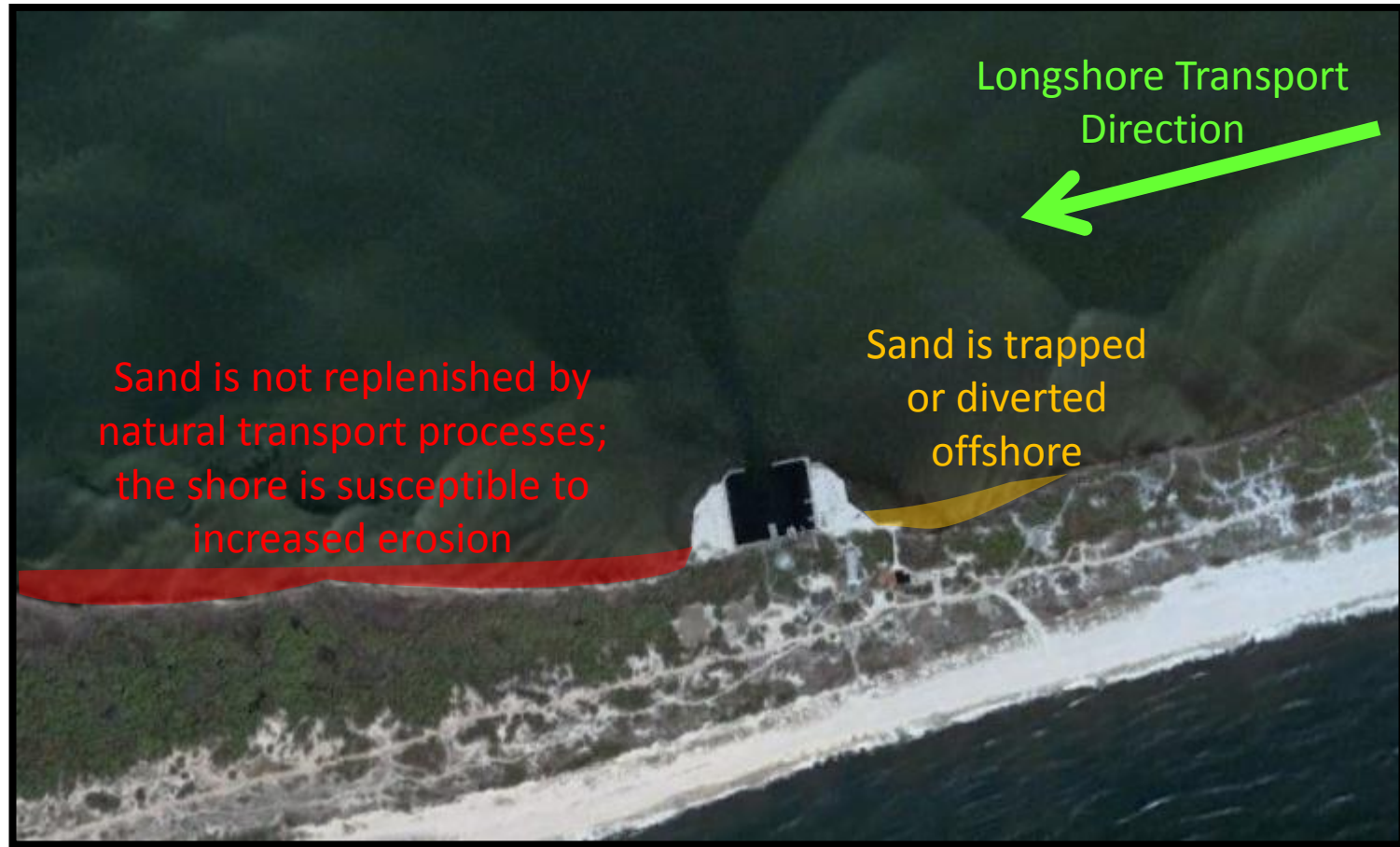
The waves push particles up the shore at an angle (**red** arrows).
Water flows perpendicular back down the shore (**yellow** arrows).



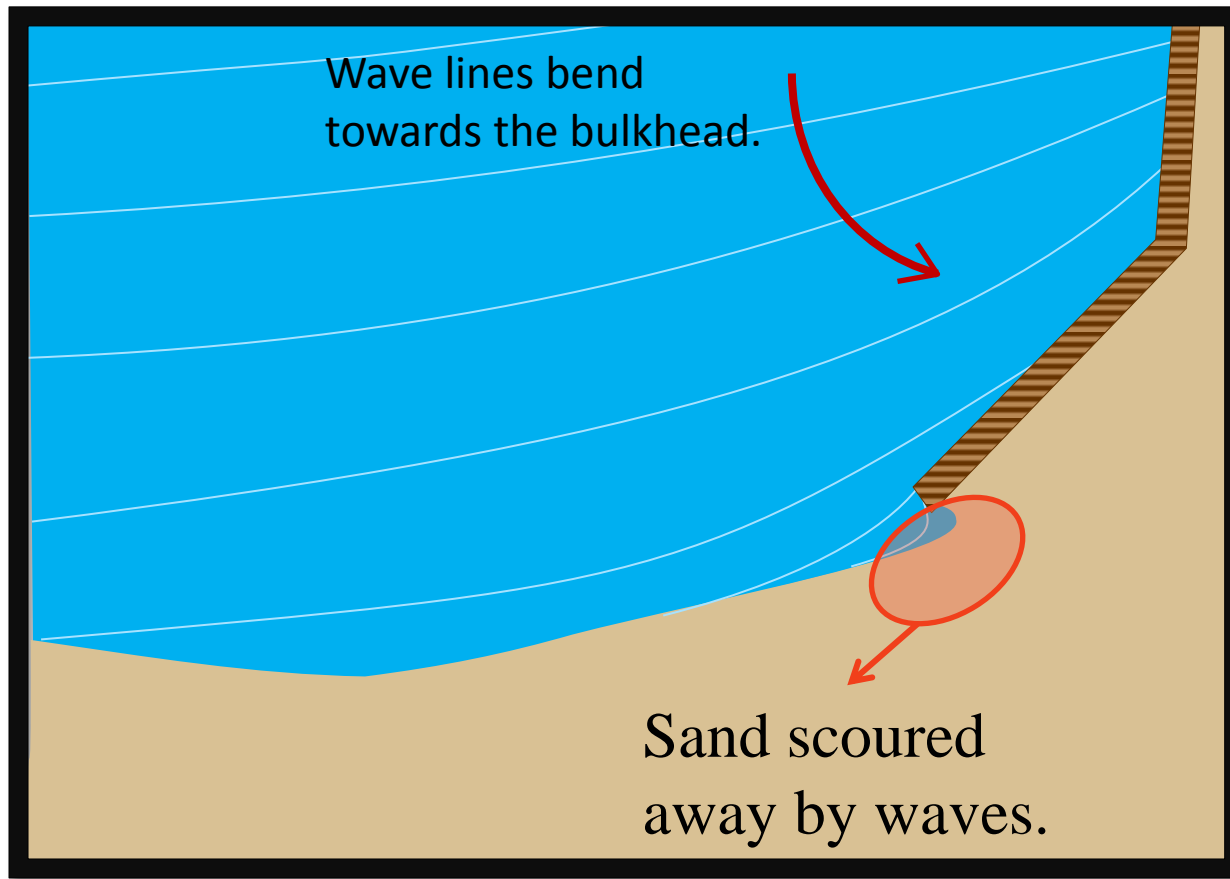
While longshore transport in the ocean is usually from east to west, the patterns of sand movement in the bay is more complex due to changing wave patterns and seafloor shape in the bay.



Longshore transport naturally moves sand along the beach, eroding, or removing, sand in some locations and accreting, or building the shoreline in others.



Hard structures like bulkheads, piers, groins and jetties disrupt this natural process and cause increased erosion downstream of the structure.



Friction with bulkheads bends waves towards the structure.
At the end of the bulkhead, this increases erosion.



You can see the increased erosion at the edge of the bulkheading at Sailors Haven.



At high tide, the bay water undercuts the Sunken Forest shoreline.

Ecosystem Effects

Natural “Soft” Shoreline



Manmade “Hard” Shoreline



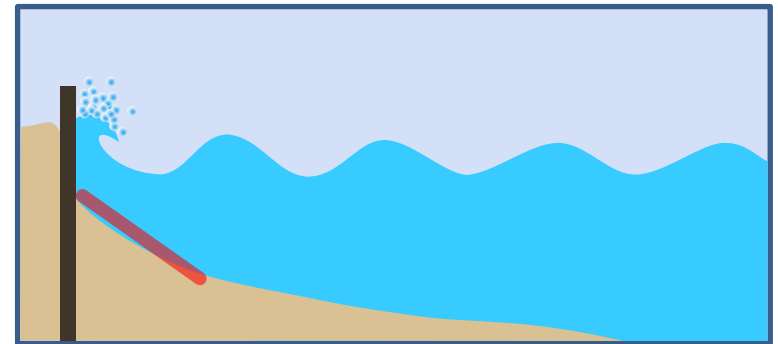
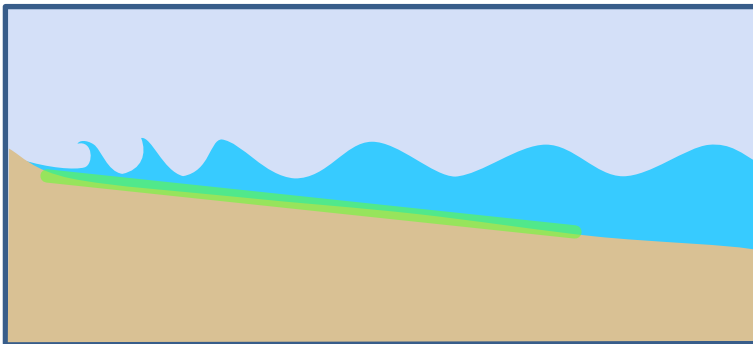
Hard structures can also have a dramatic effect on the local ecosystem.

Ecosystem Effects

Natural "Soft" Shoreline



Manmade "Hard" Shoreline



- Gradual slope absorbs wave energy

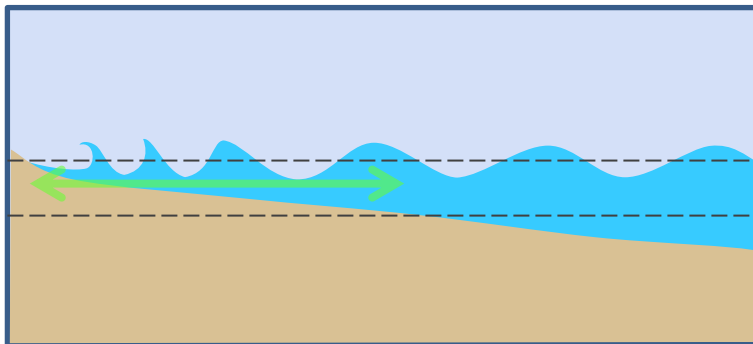
- Sudden change in slope does not absorb wave energy and can reflect it

Ecosystem Effects

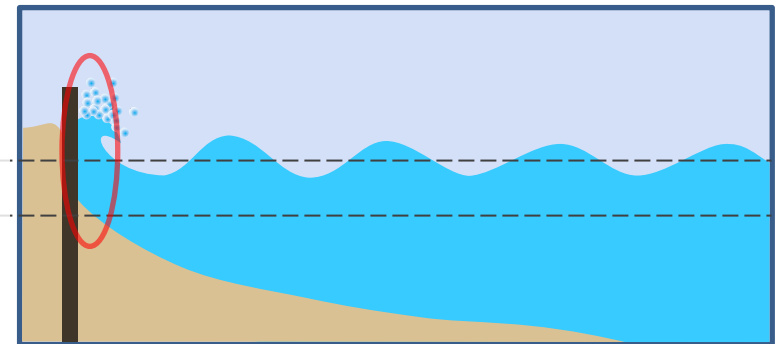
Natural "Soft" Shoreline



Manmade "Hard" Shoreline



High tide
Low tide



- Wide intertidal area and soft sediment provide area for plants and animals to colonize

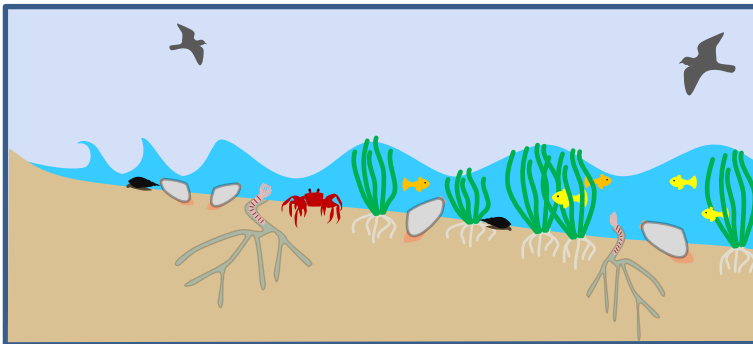
- Small intertidal area limits habitat available for plants and animals.

Ecosystem Effects

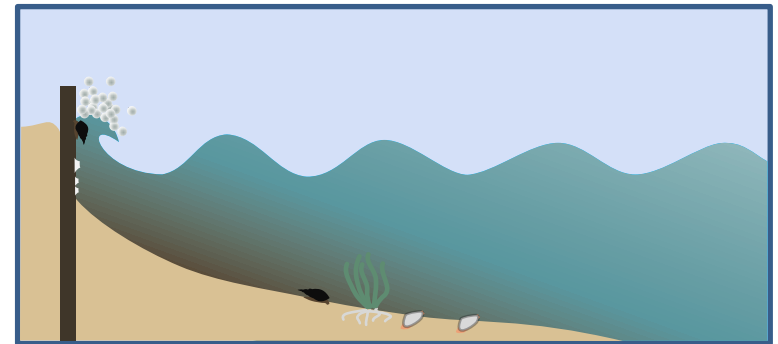
Natural "Soft" Shoreline



Manmade "Hard" Shoreline



- Feeding area for fish
- Habitat for young fish, shellfish and other invertebrates
- Nesting and spawning site for horseshoe crabs, birds, and fish



- High energy water picks up more sediment, restricting light available to plants
- Hard structure can be colonized by fewer species



The National Park Service is working with scientists at local universities on a demonstration project to restore the longshore transport process at Sailors Haven.



In November 2011, sand dredged from the Sailors Haven marina was used to create a feeder beach west of the marina.

Why is it called a feeder beach?

The sand that makes up the new part of the beach “feeds” sediment to the longshore current to transport along the bay and help restore the natural patterns of sediment movement.





Building a Feeder Beach



Sand was excavated from the channel in the marina, placed on a barge and transferred near the construction site for the feeder beach.





Building a Feeder Beach



A bulldozer moved the sand to build the feeder beach within the boundary set by the scientists.



Before



September 20, 2010

After



March 7, 2012

Yellow shading shows the extent of the constructed beach.



Satellite Image taken March 7, 2012

In the four months between construction and this image, sand has already moved west along the shoreline (in red).

Ecological Monitoring



One important scientific component to monitor is how the ecosystem adapts to the new feeder beach.



Ecological surveys using a seine net (top photo) show if there are any changes in the number and types of animals present.

Measuring Sand Movement

There are many different methods to measure how and where the sand moves.



Dyed sand was placed on the beach and scientists tracked how far it moved over a few minutes to a few hours.



Metal frames held sensors that measured the current and water level.

Measuring Sand Movement



A scientist demonstrates how a frame with a net attached catches sand blown by the wind.



Stakes were placed along the shore to mark the starting point of beach elevation profiles. These profiles can show changes in the beach over time.

Measuring Sand Movement



Scientists used a grid of stakes to measure how the beach changes over time.

Measuring Sand Movement



Rows of stakes were used to measure small changes in the shape of the beach (top).

A washer was placed around the stake where it lay on the surface of the sand (middle). As sand moved away, the washer dropped down the stake; sand moving back would bury the washer.



Scientists measured the distance between the washer and the top of the stake to measure the change in sand elevation.



The bottom photo shows a stake that had seen a lot of deposition because only an inch of the 2 foot long stake is left above the sand.

Beach Changes



2 Years Before Construction



Construction Day



2 Months After Construction

Beach Changes



4 Months After Construction

Surprising Results

- The movement of sand downdrift of the constructed feeder beach was stronger than expected, indicating a complex relationship between waves and the bulkhead.
- The photo below shows a layer of sediment with high amounts of organic material (highlighted in red) that is still an intriguing mystery for future study.



The Future

The results from this demonstration project will lead to a reevaluation of accepted practices for shoreline management on Fire Island and other locations around Great South Bay. A successful demonstration will give us more tools to help us live, work and play sustainably on a dynamic barrier island.

How can you help?

When visiting the Sunken Forest, please stay on the boardwalk, and follow posted pathways to access Sailors Haven from Great South Bay.



Visit this active research site and speak with a park ranger for more information.

